

# Chapter 7 Freeway Dynamic Message Signs

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The Arizona Department of Transportation (ADOT) is currently procuring more than one type of Dynamic Message Sign (DMS) unit. This guideline pertains only to the Freeway DMS, e.g., the overhead structure mounted *walk-in* type with 18-inch characters. Consult ADOT TTG (Transportation Technology Group) for information on other types of DMS.

Freeway Dynamic Message Signs shall be placed on overhead tubular sign structures. The overhead tubular sign structures shall meet the requirements and be in accordance with the latest ADOT Bridge Group Structure Standard Details. The structural plans shall incorporate a catwalk that extends from the Freeway DMS case to the right shoulder of the freeway, allowing access by maintenance personnel without requiring a lane closure. Placement of Freeway DMS on bridge fascia will necessitate approval from the ADOT TTG project manager (PM), as well as the ADOT Bridge Group. Collocating the Freeway DMS with other static signs on a common overhead sign structure is not allowed.

## 7.1 Master Planning of DMS Locations

The roadway designer is to determine if any Freeway DMS locations are planned for the mainline corridor that is under design. The roadway designer shall coordinate with the ADOT TTG PM to determine if a functional design has determined the approximate location for mainline Freeway DMS. Guidelines to consider when master planning the locations of Freeway DMS include:

- Two Freeway DMS are desired prior to each system interchange
- 3-mile spacing along typical urbanized mainline
- Sufficient distance prior to a closure point, such as a tunnel

Freeway DMS provide key route guidance and diversion information to the freeway driver; therefore, the proper placement of the signs is essential. Individual DMS locations may be tied to specific diversion routes and their associated exit ramp.

Once a diversion exit ramp has been identified for a DMS placement, the guidelines in the following subsections should be followed to locate the sign and associated infrastructure. Ideally, this procedure is deployed during the initial roadway design so that the location of DMS can be worked into the overall signing plan for the roadway segment. However, retrofit projects are common, and often require consideration of existing sign placement. DMS sign placements are considered highest priority and may necessitate moving other signs.

## 7.2 Longitudinal Placement of Freeway DMS

Driver readability to the Freeway DMS should be a minimum of 1,000 ft. This distance is intended to allow a minimum of 8 seconds of viewing time when traveling at freeway speeds, or sufficient time to read a single 3-line message display. Additional driver visibility of 1,000 ft to a point 2,000 ft in advance

of the Freeway DMS is recommended. Underpasses, sign bridges, or horizontal or vertical curvature are not to restrict the driver's continuous visibility of the sign within the 1000 ft., and are not to restrict the cone of vision (the pie shaped region in front of the DMS where it is readable) beyond a 15-degree angle. The desirable spacing from the Freeway DMS location to any adjacent guide signing is 1000 ft. The minimum desirable spacing between sign structures is 800 ft. Some situations may require less distance, which is not a safety factor, as DMS and static signs have been collocated in the past.

Some situations may develop where the general positioning of a DMS must be modified. Rearrangement of a sign location must consider sign visibility, the relationship of the Freeway DMS to the static signing, and the relationship of the Freeway DMS to the diversion exit.

After receiving a diversion message, drivers must safely maneuver to the appropriate exit. A good rule of thumb to use is that the Freeway DMS should be located a minimum of one-quarter mile upstream of the diversion exit for each lane change that a driver would have to make to merge from the innermost lane to the right-hand lane in order to exit. For example, for a four-lane freeway section in one direction, the Freeway DMS location should be approximately  $3 \times 1,320$  ft., or about 4,000 ft., upstream of the exit taper. Often, this rule may lead to Freeway DMS sign placement more than one interchange prior to the potential diversion exit. Figure 7.1 illustrates the longitudinal placement guidelines.

## 7.3 Lateral Placement of Freeway DMS

Maintenance catwalks must be provided between the Freeway DMS walk-in sign and the right shoulder of the roadway. This setup is illustrated in Figure 7.2.

Foundations for the Freeway DMS structures are to be placed as far as practical from the traveled way. The general distance desired is a minimum of 33 feet. Structural requirements of the support, the specified span length, maintenance access to the sign, and roadside obstacles determine the practical limit for the foundations of the structure.

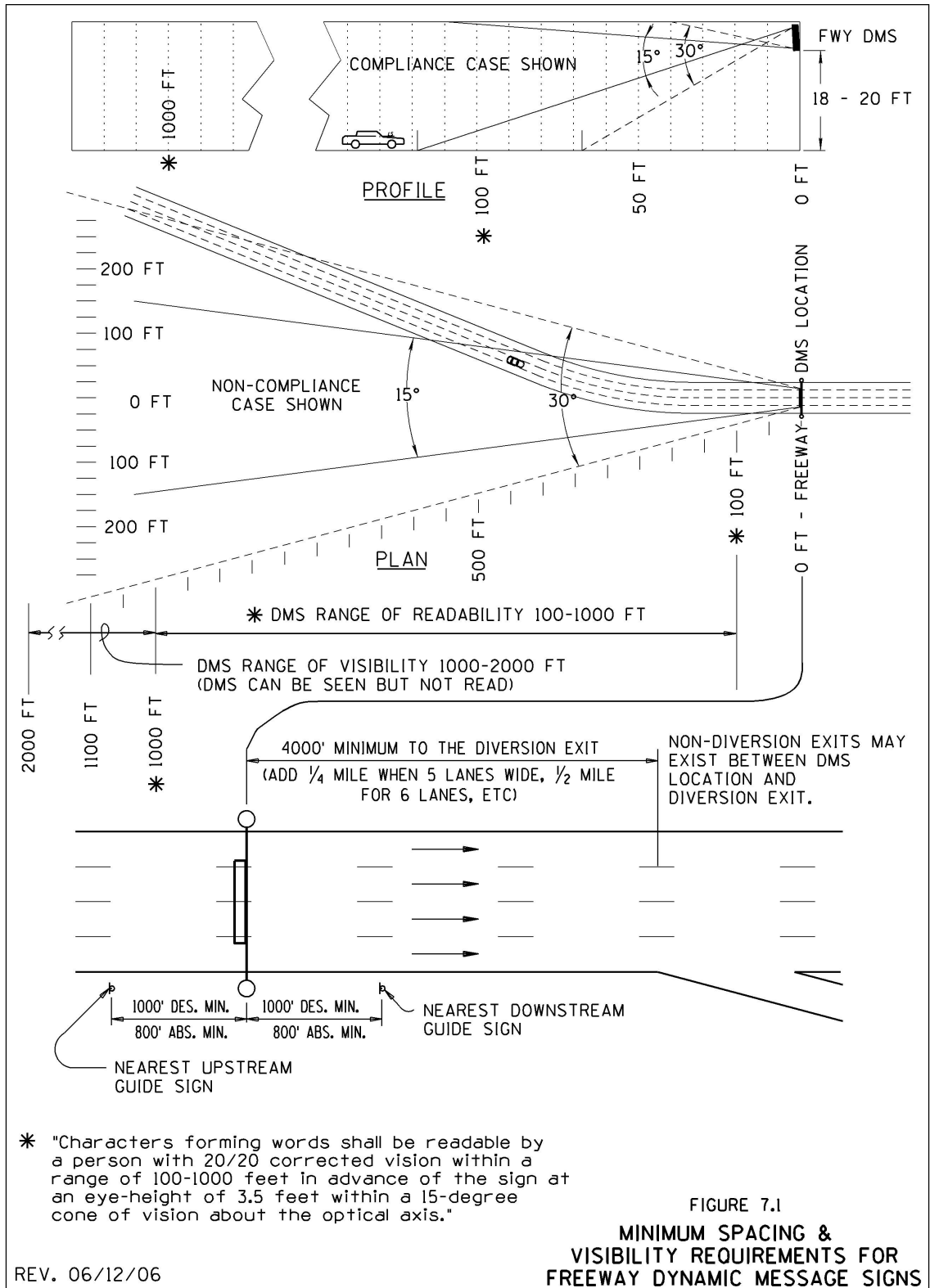
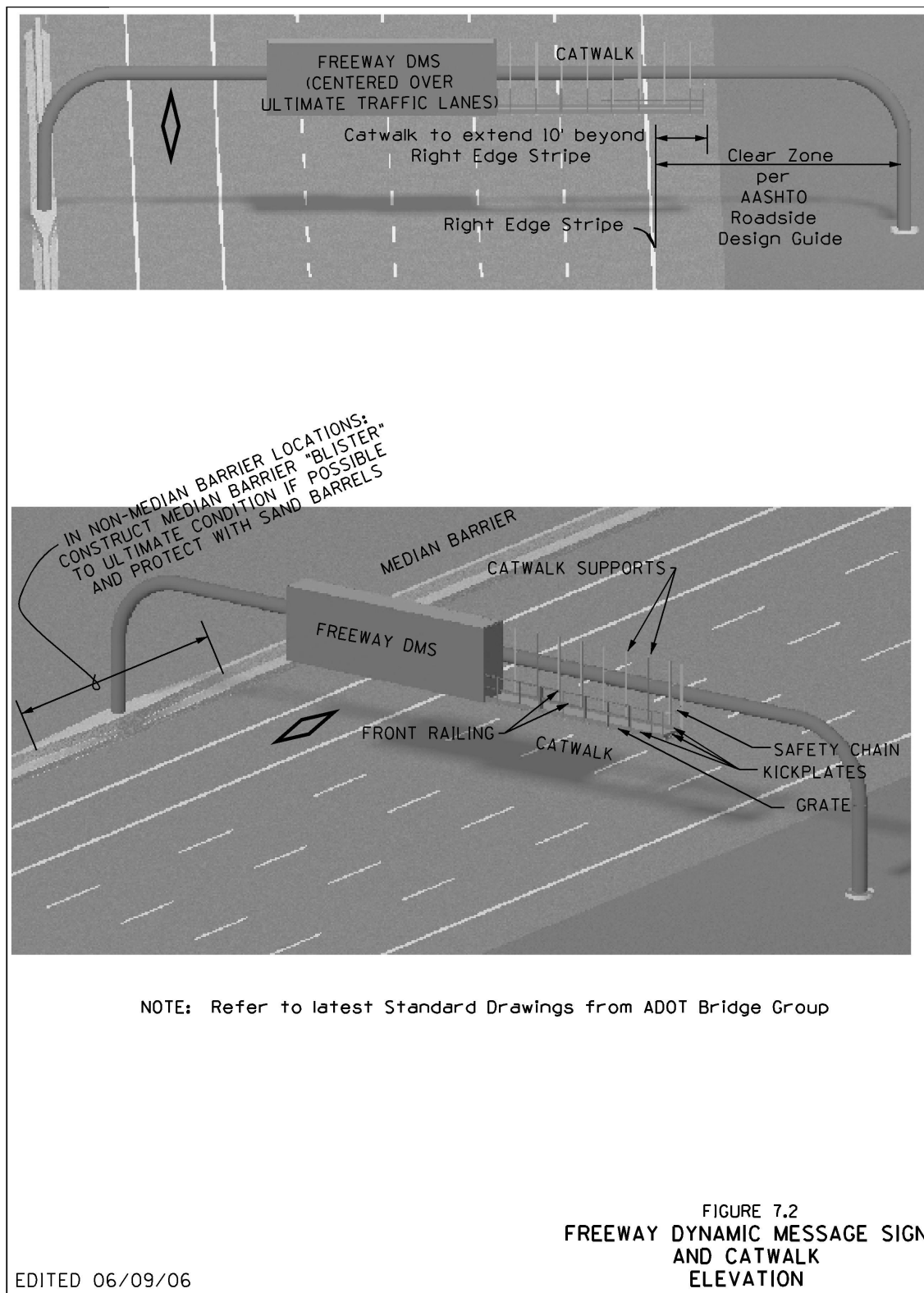


Figure 7.1 Freeway Dynamic Message Signs



**Figure 7.2 Freeway Dynamic Message Sign and Catwalk Elevation**

All DMS supports must conform to the requirements found in the *AASHTO Roadside Design Guide*. Where freeway DMS foundations otherwise pose a risk to passing vehicles, impact attenuation devices or concrete traffic barriers are to be designed and installed.

Where Freeway DMS foundations will be installed in an open median, the median foundation must be designed and constructed to accommodate ADOT standard F type barrier located on the median centerline. The median foundation is evaluated to determine if the foundation qualifies as a clear zone obstruction, requiring adequate protection.

Where Freeway DMS foundations must be placed in the clear zone and an adequate clear zone is not met, protection must be provided. The designer must design for both the final foundation location and necessary protection during construction. Consideration should also be given to probable future widening of the mainline and/or ramps, lane configuration, frontage roads, and available shoulder configuration. Consequently, any opportunity to install Freeway DMS foundations further from the edge of traveled way should be considered.

Freeway DMS are installed on ADOT standard overhead tubular frames only. ADOT currently does not permit the installation of a Freeway DMS on a cantilever sign structure. Structural Detail drawings for the Tubular structures can be found at:

Vertical clearances at Freeway DMS sign structures shall be between a minimum of 18' and a maximum of 20' from the high point of the roadway cross-section at the sign structure to the bottom of the support stringers for the catwalk assembly. This range in vertical clearance will provide for optimal viewing of the messages on the Freeway DMS signs.

## **7.4 Freeway DMS Controller Cabinet Placement**

This section describes installing the controller cabinet in new and legacy installations.

### **7.4.1 New Installations**

ADOT anticipates deployment of a Freeway DMS for new installations that will include a small pole mounted or ground mounted cabinet. A pole-mounted cabinet would be mounted on the right shoulder Freeway DMS structure support pole, facing away from traffic. A ground-mounted cabinet, and, where required, a transformer enclosure, would be placed near the structure support pole.

### **7.4.2 Legacy Installations**

More rigorous standards are associated with relocations or new installations of the shuttered fiber-optic display type Freeway DMS that has been widely used by ADOT up to this time. The location of the Freeway DMS controller cabinet is important for proper operation and maintenance of the sign and the control and communications equipment. It is desirable that the cables connecting the controller cabinet and the sign are not to exceed 100 ft. in length. If Freeway DMS locations are known, a minimum area of 38 in x 74 in must be reserved for subsequent construction of a foundation for a 344 cabinet type IV with transformer cabinet. The Freeway DMS controller cabinet is to be placed such that maintenance access is

not hampered. The sign controller is desired to be located within 25 feet of the Freeway DMS structure. A service vehicle should be able to park in the immediate vicinity of the sign and its controller without blocking traffic.

## **7.5 DMS Cabinet Power, Communication, and Conduits**

The designer should coordinate with the Freeway DMS vendor for power, communication, and conduit requirements.

Conductors and circuit breakers should be sized based on voltage drop calculations using peak loads calculated if the DMS were lit, with accessories (fans, etc) in operation, and convenience outlets were drawing a 12-amp load.

Communication is provided via fiber-optic tail circuit from the FMS communications trunkline to the DMS controller. In locations where there FMS trunkline does not exist cellular and dial-up communications are required.

The conduit from the electrical power source (usually the trunk line power conduit, or occasionally a nearby load center) to the sign controller cabinet is to be 3 in. diameter. The conduit from the pullbox on the trunk communications conduit to the cabinet is to be 3 in. diameter. On legacy installations, two 3-in. conduits are to be run from the Freeway DMS sign to the ground-mounted sign controller cabinet for power and Freeway DMS control cables. The newer pole-mounted controller cabinet will eliminate the need for these two 3-in. conduits (since the ground mounted controller cabinet is eliminated). Rigid metal conduits are to be provided where cable runs are exposed on bridge truss structures. Flexible watertight conduits shall be used from the conduit nipples (small access holes) on the Freeway DMS sign structure to the back of the Freeway DMS. Conduits typically extend from the sign controller cabinet to the sign foundation, but conduits are not required within the tubular sign structure.